REMARKS

In a non-final Office Action dated April 25, 2008, the Examiner provided a claim interpretation for "microchannel" and "wall," refused to accord priority to the prior-filed applications for "microchannels" and imposed reformulated rejections under 35 U.S.C. § 103.

Applicants respond to each issue below. In view of the amendments above and remarks below, Applicants respectfully request reconsideration of the merits of this application.

Claim Interpretation

The Examiner broadly interpreted the words "microchannel" and "wall," alleging that a "microchannel" can be a "'channel' of any size" and that a "wall" can be "DNA affixed or attached to any surface, including a rounded particle or bead." Applicants respectfully disagree.

"Microchannel" does not encompass a "'channel' of any size." While the Examiner alleged that the Specification does not provide a specific definition of the size at which a channel is a microchannel (*see*, p. 3 of the Office Action), one of ordinary skill in the art recognizes the dimensions and suitable construction of a microchannel for use with polymeric molecules.

Because microchannels for use with polymeric molecules are well known in the art, Applicants are not required to provide exhaustive detail about how to construct a microchannel and its dimensions, as "a patent need not teach, and preferably omits, what is well-known in the art." *See*, MPEP 2164.01, citing *In re Buchner*, 929 F.2d 660, 661 (Fed. Cir. 1991); *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 1384 (Fed. Cir. 1986), cert. denied, 480 U.S. 947 (1987); and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1463 (Fed. Cir. 1984). As support for the general level of knowledge in the art, Applicants direct the Examiner to the following documents, which are provided in a Supplemental Information Disclosure Statement accompanying this submission and were published prior to the application filing date: Kiba Y, *et al.*, "DNA analysis by microfabricated capillary electrophoresis device," Nucleic Acids Symp. Ser. 42:57-58 (1999); Shrewsbury P, *et al.*, "Characterization of DNA flow through microchannels," International Conference on Modeling and Simulation of Microsystems, Semiconductors, Sensors and Actuators; San Juan, Puerto Rico; April 19-21 1999, pages 578-580; Zhao B, *et al.*, "Surface-directed liquid flow inside microchannels," Science 291:1023-1026 (2001); and US Patent No. 6,054,034 (filed May 9, 1997 and claiming the benefit of applications that date back to February 28, 1990).

The application is consistent with the general level of knowledge in the art. As acknowledged by the Examiner, the application discloses that a microchannel has at least one dimension (*i.e.*, a length, width or height) defined by microns (*see*, paragraphs [0051]-[0052] of the application). The following table contains a list of additional support in the application and priority documents (*i.e.*, US Patent Nos. 5,720,928; 6,294,136 and 6,610,256) for microchannels.

Table 1: Support in application and priority documents for microchannels.

Document	**Location of Support**	**Microchannel Specifics**
US Patent Nos. 5,720,928; 6,294,136 and 6,610,256	FIG. 25	"diameter of 10-20 microns"
US Patent Nos. 5,720,928; 6,294,136 and 6,610,256	Section 5.1.3. FLOW-BASED TECHNIQUES	"The laminar flow chamber should contain a thin space, for example, a space generated via a 10-20 micron opening."
		"For example, one acceptable flow would be approximately 5×10^{-2} nl/sec at 100×20 micron opening."
Application	Paragraph [0051]	"In a 50-micrometer wide micro-channel 14, for example, the velocity of flow 32 may range from 15 to 70 micrometers per second as measured across the lumen of the micro-channel."
Application	Paragraph [0052]	"In one embodiment, the cross-sectional width 38 of the micro-channel 14 is 50 micrometers and is preferably less than 100 micrometers. More generally, it is believed that the width 38 will be between one and one hundred times the straightened length 40 of the polymeric molecule 36."

Application	Paragraph [0057]	In discussing how to make a microchannel ... "The silicon wafer is then etched to a depth of 7 to 8 micrometers defining the height of the micro-channel 14."

In summary, the application, in combination with the general level of knowledge in the art, provides one of ordinary skill in the art with adequate guidance as to the dimensions of a microchannel for use with polymeric molecules. As such, a "microchannel" is not a channel of any size, but a channel limited to microns in at least one dimension.

"Wall" does not encompass "DNA affixed to any surface, including a rounded particle or bead." As discussed above, the application discloses and the claims require a microchannel, which one of ordinary skill in the art understands as having at least a length, width and height, thereby permitting laminar flow of a fluid through the microchannel. Contrary to the Examiner's strained interpretation of "wall," rounded particles or beads cannot be a wall of a microchannel as defined in the application. Laminar flow about a polymer affixed to a wall cannot occur in the context of rounded particles or beads. Moreover, and as discussed in greater detail below, laminar flow is necessarily prevented when a particle/bead is used in connection with a microchannel as contemplated in the application. As such, a "wall" is not any surface, including a rounded particle or bead, but is instead a surface defined by the length, width or height of a microchannel.

Priority Claim

The Examiner continued to allege that the prior-filed applications do not support methods combining laminar flow and microchannels and that the prior-filed applications (now US Patent Nos. 5,720,928; 6,294,136 and 6,610,256) are directed only to methods on a planar surface. On page 12 of the Office Action, the Examiner noted that the prior-filed applications do not teach straightening of polymeric molecules in a microchannel format. Applicants respectfully disagree.

The prior-filed applications provide support for methods using laminar flow in connection with microchannels. For example, US Patent Nos. 6,610,256; 6,294,136 and

5,720,928 each show laminar flow in microchannels having a width of 10 to 20 microns (*see*, FIG. 25 of each document). For the Examiner's convenience, FIG. 25 from the prior-filed applications is reproduced below.

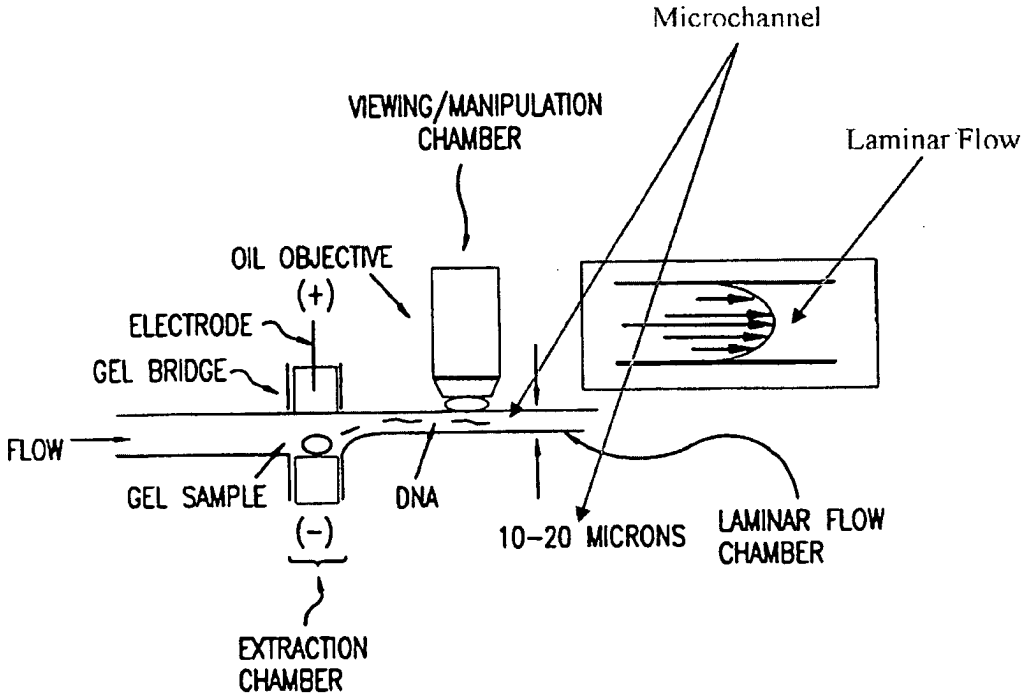


FIG.25

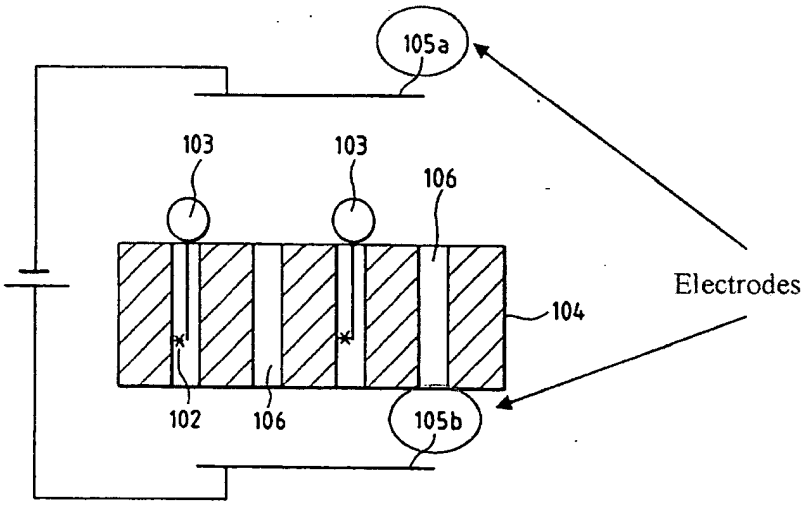
Because the prior-filed applications show laminar flow used in connection with a microchannel to straighten polymeric molecules from gel inserts, the pending claims are entitled to the claimed priority dates with respect to the use of laminar flow to straighten such molecules.

Rejections Under 35 U.S.C.§ 103

The Examiner rejected Claims 21, 23-25 and 27 as obvious over US Patent No. 5,356,776 to Kambara *et al.* in view of US Patent No. 6,265,153 to Bensimon *et al.* The Examiner alleged that although Kambara *et al.* did not disclose direct attachment of a polymeric molecule to a first wall of a microchannel, it disclosed a particle/bead for fixing the polymeric molecule and alleged that the particle/bead is analogous to a wall of the microchannel, which one of ordinary skill in the art would use after reading Bensimon *et al.* Applicants respectfully disagree.

As previously discussed, Kambara *et al.* disclosed attaching a bead to one end of a polymeric molecule, such as DNA, labeling a second end of the molecule, and then introducing the modified molecule into a channel until the bead blocks the channel aperture (*see*, FIG. 8; Column 4, lines 1-17 -- one terminus of DNA molecule is fixed first to bead and label, and then the fixed DNA is led to a matrix having apertures passable to DNA; *see also*, Column 10). With one end of the polymeric molecule fixed at the end of the channel by the bead, the molecule extends in an electric field or a liquid flow other than laminar flow. Kambara *et al.* provided no more than passing references to using flow, let alone laminar flow, to elongate the polymeric molecules (*see*, Column 14, lines 27-29).

More importantly, the Examiner failed to present a *prima facie* case as to how laminar flow can occur in a microchannel when one end of the microchannel is blocked by the bead. Shown below is FIG. 8B of Kambara *et al.*, which clearly disclosed that Kambara *et al.* used electric fields to elongate polymeric molecules attached to the bead (*i.e.*, 105a and 105b are electrodes; *see also*, 17 and 18 of FIGS. 4-6). Applicants respectfully ask the Examiner to show how laminar flow can occur in a microchannel when one end of the channel is blocked or substantially blocked by a bead. Applicants submit that if any flow can occur, it is necessarily turbulent flow, in which the fluid undergoes irregular fluctuations and mixing.



As noted in Applicants' previous responses, Bensimon *et al.* disclosed using two cover slips to elongate polymeric molecules. Two coverslips, however, have no side constraints, and

cannot form a microchannel, which has at least a bottom and sides, as is shown, for example, in Applicants' FIGS. The structures formed by a pair of cover slips in Bensimon *et al.* lack sides and cannot be considered microchannels.

More importantly, the fluid dynamics of Bensimon *et al.* are opposite to those of Applicants. Applicants use (and claim) laminar flow, which is at a leading edge of a solution, to cause polymeric molecules to adhere to the microchannel surface. In contrast, Bensimon *et al.* disclosed using capillary action/convection (principally caused by evaporation at a trailing edge of a solution) to create a meniscus that aligns polymeric molecules attached to a surface. *See* FIG. 6 of Bensimon *et al.* and Column 2, lines 59-68; Column 17, lines 41-45; and Column 19, lines 30-32. Moreover, Bensimon *et al.* teach away from using laminar flow by expressly noting that the flow types used by Applicants are not as efficient as a meniscus. *See*, Column 4, lines 7-20 of Bensimon *et al.* Paragraph [0050] of the application contrasts the differences between laminar and capillary flow/convection. Because neither Kambara *et al.* nor Bensimon *et al.* contemplated or disclosed using laminar flow alone to elongate and fix polymeric molecules within microchannels, they cannot render obvious the pending claims. Moreover, Applicants submit that they have shown above that FIG. 25 of the priority documents support Applicants' priority claim, which predates any of the cited documents.

In an effort to advance prosecution of the application and clarify the claimed methods from the citations, Applicants amend Claim 21 to recite that the laminar flow causes elongation of the polymeric molecule, which then can adhere in a straightened configuration to the first wall of the microchannel. Support for this amendment is located, *e.g.*, in paragraphs [0011] and [0014] of the application. In view of the amendments above and the remarks herein, Applicants respectfully request reconsideration of this rejection as applied to Claims 21, 23-25 and 27.

The Examiner then rejected Claim 26 as obvious over Kambara *et al.*, *supra*, in view of Bensimon *et al.*, *supra*, in further view of Kaiser D, *et al.*, "Spermine protection of coliphage lambda DNA against breakage by hydrodynamic shear," J. Mol. Biol. 6:141-147 (1963). The Examiner alleged that although neither Kamabara *et al.* nor Bensimon *et al.* disclosed using a condensing agent to protect polymeric molecules, one of ordinary skill in the art would have done so after reading Kaiser *et al.* Applicants respectfully disagree.

While the Examiner accurately summarizes Kaiser *et al.*'s description of treating polymeric molecules with a condensing agent, the rejection must fall for the reasons noted

above. That is, neither Kambara *et al.* nor Bensimon *et al.* contemplated or disclosed using laminar flow alone to elongate and fix polymeric molecules within microchannels. Kaiser *et al.* does not bridge any gaps among Kambara *et al.*, Bensimon *et al.* and the pending claims, as Kaiser *et al.* likewise did not contemplate or disclose that one could use laminar flow alone to elongate and fix polymeric molecules. In addition, Applicants submit that Kambara *et al.* and Bensimon *et al.* are improper citations because the application is entitled to the priority claim. In view of these remarks, Applicants respectfully request reconsideration of this rejection as applied to Claim 26.

Additional Remarks

In view of Applicants' amendment and remarks above, no citation adversely affects the non-obviousness of the pending claims. Applicants therefore made a diligent effort to place the pending claims into condition for allowance. However, should any issues remain, Applicants respectfully request that the Examiner contact Applicants' attorney directly to expeditiously resolve them. For the reasons stated herein, this application is now believed to be in condition for allowance and such action is respectfully requested.

Fees

An extension of time for two months accompanies this response. If any other extension is required in this or any subsequent response, please consider this to be a petition for the appropriate extension of time and a request to charge the petition fee due to Deposit Account No. 17-0055.

No other fee is believed due in connection with this submission. However, if a fee is due, in this or any subsequent response, please charge the fee to Deposit Account No. 17-0055.

Respectfully submitted,

/Bennett J. Berson/
Bennett J. Berson
Reg. No. 37,094
Attorney for Applicants
QUARLES & BRADY LLP
P.O. Box 2113
Madison, WI 53701-2113

TEL (608) 251-5000
FAX (608) 251-9166